

**Desalination by evaporation into circulating air**

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**Abstract of DE 2018726 (A1)**

Desalination by evaporation into circulating air Fresh water is obtained from salt water by passing a gas-flow through hot salt water, then to a heat exchanger, removing the condensed fresh water and passing the gas flow, after adding cold sea water, back through the heat exchanger in contraflow. - The unavoidable consumption of heat to heat up the sea water is compensated.

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### Claim

Method to the recovery of fresh water from salt water, characterised in that one a gas stream in the circuit by hot salt water and an heat exchanger führt das condensed fresh water separates and the gas river after adding cold 1-Teerwassers over the warming exchanger in the countercurrent leads back as well as the more unver avoidable heat consumption by supply from warm ones to the hot sea water adjusts.

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"Methods to the recovery of fresh water from salt water" over the importance of the recovery of Süßwasser from sea water for the supply of the population, the agriculture and the Industrie with water give an immense number of Publications information.

Likewise numerous are the publications, which are concerned with the technical implementation of this problem.

It is here therefore only on the continuous report of professor Dr.-short Fischbeck, Heidelberg in the magazine chemist Ztg./ChemApparaturen 88.Jahrgang (1964) Nr.5 FF.

"The industrial production from fresh water more rEeer" referred.

but 30 proposed methods become at present seriously followed.

Now a novel method was found to the conversion by salt water in fresh water. It concerns a thermal process with phase transformation, thus around a process, as he takes place similar also continuous in the nature. From the sea water evaporates into the air located over it, the moist air arrived by air currents into colder regions, and in the air located waters precipitates from it as rain if the partial pressure of the water vapor is exceeded.

The new process would be to be arranged therefore still at the earliest in the column of the evaporation processes, under which one in the pertinent technology all types of sun distillations understands.

The difference of the new process to the Verdunstungs processes consists now however of the fact that here as energy source the solar power used will and that appropriately also not at Atmosphärendruck sondern at light increased pressure it is not worked.

The twice phase transformation made as with the other group of demineralization procedure, the evaporation procedures, by evaporation and condensation. At the evaporation procedures suggested so far one works only with salt and/or. Fresh water as liquid phase and with pure water vapor as gas phase.

With the novel method the gas phase is against it ever.

with water vapor loaded air.

The new process runs off over the change of the partial pressure of the water in the gas with change of the temperature. It could be net therefore as Partialdrucktrennung bezeichnet.

The novel method is the result of extensive experiments to use the findings from the method to the separation of material mixtures by means of supercritical phases of third fabrics for the separation of salt water in sea water and soils. The principle of the separation of organic material mixtures by means of supercritical gases is in the Austrian patent nr.255371, that GDR patent 41362, as well as the British patent 1057.911 stated.

Both methods common that a part of a material mixture in a gas becomes received, the loaded gas separated is and finally the received fabric from the gas recovered, while the gas becomes recycled. However nevertheless fundamental differences between both methods exist.

In a gas in the supercritical state can be taken up fabrics occasionally in an amount, which lies around several powers of

ten higher, than it would correspond to the partial pressure of the fabrics.

The receptacle of the fabrics in the supercritical foreign gaseous phase as well as the deposition from it is not connected with a conversion of warm ones. Comparisons for this example 15 in the GDR patent 41,362.

With the novel method, with which remdgas, thus the air becomes, applied in the subcritical state, well türlich only a loading of the air with water vapor up to the respective partial pressure of the water is possible and the loading is with the application of the heat of vaporization connected, as the recovery of the water from the air with the gain is der condensation-warm connected.

The neue-Verfahren points now a path to use the condensation-warm more immediate to the evaporation of water to have to pump without storing it occasionally in any heat carrier as sensible heat, or bottom stepwise reduced pressure many times or however they use her by vapour compression on a higher level.

The method is precise explained on the basis a Fliessbildes.

In a container A becomes sea water by means of the electrical heater B on for example 110 heated. By the water air becomes a bottom pressure of for example 4 atil blown with C. The air satisfies itself with water vapor and arrives with D into the heat exchanger E. Daraus outgoing with F flows it cooled into the container G, where condensed water and air separate themselves. The air becomes with H withdrawn and over the gas rotary pump J the heat exchanger with K again, supplied. In the line between J and K is course-pumped with L the sea water which can be separated. Cold air and cold sea water flow now in the heat exchanger the common hot air satisfied coming from the container A with water vapor against, whereby such as waters and itself those heat themselves air Air simultaneous with water vapor satisfies. Now again the hot, with water vapor gesattigt with unit air withdraws from the heat exchanger with M and arrives with C again into the container A. In of the entire apparatus prevails the same total pressure of for example 4 atue and the gas rotary pump J holds the Luftumlauf only upright one. Around sea water into 1 part with L twice as much sea water in-pumped as from the container G fresh water will divide fresh water and 1 part of sols with N withdrawn becomes. The other half, the Solewird from the Behälter A with O withdrawn, Xassiert likewise the heat exchanger, whereby it delivers its sensible heat and cold withdraws with P.

The hot air satisfied incoming into the heat exchanger with D with water vapor and the cold air water mixture incoming with K exchange its sensible heat against each other, beyond that however become the resulting condensation-warm continuous over the whole Heat exchanger direct as Verdampfungsvfcd, re to sow it gung the heating air Wassserger;

▲ top lisches with leasing serdampf reacted.

In of a small Versuchaparatur, which tries precise after the described Yliessbild constructed out the warwurde novel method. The container A had a Jnhalt of ca.60 of litre. and in it the located approx. 30 litre salt water became on lo C heated. A Thermregler held the temperature constant and a kilowatt counter for the allowed energy consumption to measure.

The heat exchanger consisted of 5 m a prolonged Kunfer pipe of 7 cms light Weite. In it was 5 well rallel connected as well as a single copper tube of 1.5cm clearance pipes and spaces was with 4x4 mm coils of copper sheet filled. Containers A, heat exchangers E and all feed lines were good isolated. The container G had a Jnhalt of approx. 20 litre.

One worked with air a bottom pressure of 4 atue as rotating gas. The gas rotary pump J held a circulation of ca.3 cbm for pressurized air per hour upright. With L became approx.

lo Ltr.5 & more zwasser with a common salt content of 3.5 thread.

per hour course-pumps. Simultaneous ones could with N ca.5 of litre.

Fresh water with a common salt content of bottom 20 ppm and with P ca.5 of litre sols with a common salt content v vre approx.

7 thread. % per hour withdrawn become. Custom per liter of prepared fresh water amounted to approx.

32 Kcal, that significant is less than the heat consumption in the 36-stufigen flash evaporation plant in San Diego, Kifornien, who manufactures daily 3,900 cbm fresh water. There 1 kg is water vapor to the production of 9.85 kg fresh water required.

The 32 Kcal per kg of Süßwässer, found in the described experiment, will not represent surely yet the minimum at heat energy, which will be more achievable after the novel method.

over the Investitionskosten of a large-scale installation after the novel method there is natural still no indications, but might it because of the simpleness of the novel method surely only a fraction of the costs constitute, which would be

required for the creation of a plant after that so far prior art processes.

In the novel method can be used instead of Luft also different gases. Nitrogen could decrease the corrosion möglicherweise SE. The risk of incrustation is gering' in the new process water never for simmering comes there.

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